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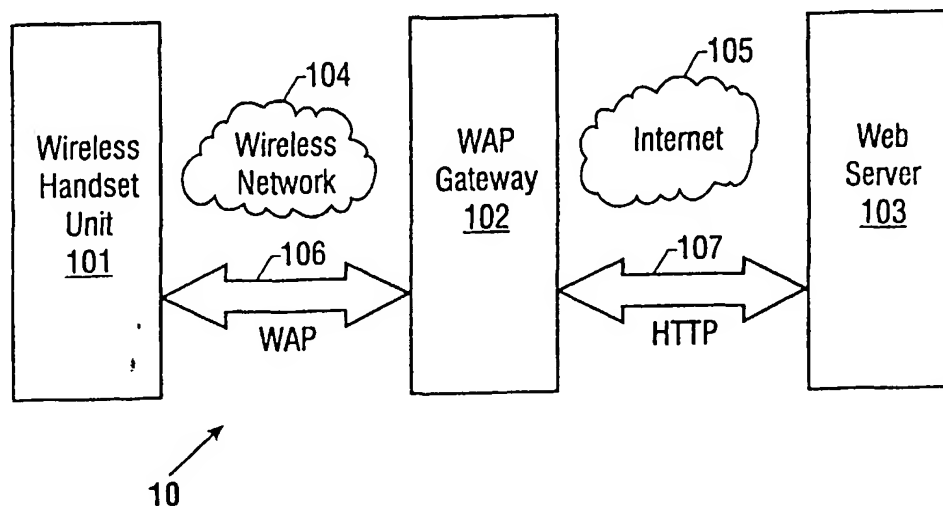
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(54) Title: **CUSTOMIZING TABULAR DATA FOR WIRELESS HANDSET UNITS**



(57) Abstract: Tabular data for display on wireless handset unit may be customized prior to display on the handset unit. Upon request, a server may provide information about the tabular data and a display menu to define a fragment of the tabular data to be displayed on the wireless handset unit. Based on the wireless subscriber's response to that information, the tabular data is provided in a customized fashion.

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CUSTOMIZING TABULAR DATA FOR WIRELESS HANDSET UNITSBackground

This invention relates in general to wireless data communication systems.

5        Wireless data communication can provide wireless data service subscribers with up-to-date information for stocks, weather, news, sports, etc. Numerous wireless data services are based on a wireless technology known as the Wireless Application Protocol (WAP). See WAP-100, Wireless  
10    Application Protocol Architecture Specification available from the Wireless Application Protocol Forum Ltd., Mountain View, California 94040. WAP is a set of wireless protocol specifications, aiming to standardize the way wireless handset units such as cell phones and pagers access Internet  
15    data and services. The WAP specifications leverage and extend existing Internet standards, enabling web application developers to tailor their content to the need of the wireless users.

      WAP applications or services are based on Wireless  
20    Markup Language (WML) and WML Scripts (WMLS). WML is based on the Extensible Markup Language (XML). It uses a deck/card metaphor to specify a WML service. A card is a unit of interaction with the user, either a presentation of information or a request for information from the user. A  
25    collection of cards is called a deck, which constitutes a WML service. Each WML document represents a deck. WMLS, which is ECMA Script, is a lightweight procedural scripting language. It can be used for enhancing services written in WML. For example, it can be used for validating user input  
30    on the wireless handset unit.

      In addition to being wireless network independent, the WAP is also independent of any particular wireless handset

device. Instead, WAP specifies a bare minimum functionality for a handset device.

Unlike a desktop computer, a wireless data service client (e.g., cell phone or personal digital assistant (PDA)) may have a less powerful processor, less memory, restricted power consumption, different input devices (e.g., phone keypad) and a smaller display. The smaller size of the display restricts the amount of information that can be displayed on wireless handset units. For instance, a typical cell phone's display consists of about 5-6 lines and about 12-20 characters per line. This restriction may severely impact the amount or types of information that can be rendered on a wireless handset unit. In contrast, many wireless data service subscribers are used to viewing rich contents including tabular data on their desktop systems.

Tabular data is two-dimensional. It has an arbitrary number of columns and rows of information. Typically, each column represents a specific aspect or property of an entity, while each row represents information for different entities. For example, a stock portfolio data may have the following information for every stock in the portfolio: ticker, symbol, time, last price, open price, day's high, day's low, 52-week high, 52-week low, volume, and average volume.

Tabular data is typically generated on the web server from database tables or from persistent storage such as text files. Common Gateway Interface (CGI) scripts are mainly used to create tabular data dynamically. WAP applications or services can be hosted on web servers using CGI script technologies such as Active Server Pages (ASPs), Java Servlets, Java Server Pages (JSPs), etc.

Displaying tabular data on wireless handset units poses challenges due to the smaller size of the wireless handset

display. Wireless data service providers may simply display a smaller subset of the tabular data on the wireless handset unit. In other words, the data to be displayed on the wireless handset unit is prepackaged on the web server by the service provider. As a result, a wireless data service subscriber may not have access to other relevant information within the tabular data.

Thus, there is a need for better ways to facilitate the display of tabular data on wireless handset units.

#### 10                    Brief Description of the Drawings

Figure 1 is a block diagram of a wireless data services system in accordance with one embodiment of the present invention

15                    Figure 2 is a block diagram of a request, response model in accordance with one embodiment of the present invention;

Figure 3 is a message diagram for communications between a wireless handset unit and web server in accordance with one embodiment of the present invention;

20                    Figure 4 is a depiction of a user interface in accordance with one embodiment of the present invention;

Figure 5 is a block diagram of a web server in accordance with one embodiment of the present invention; and

25                    Figure 6 is a flow chart for software stored on said web server in accordance with one embodiment of the present invention.

#### Detailed Description

A wireless communication system 10, shown in Figure 1, includes a wireless handset unit 101, a WAP gateway 102, and a web server 103. The WAP 106 is the protocol interface between the wireless handset unit 101 and the WAP gateway 102, while HTTP 107 is the protocol interface between the

WAP gateway 102 and the web server 103. A wireless network 104 couples the wireless handset unit 101 and the WAP gateway 102. The Internet 105 couples the wireless gateway 102 and the web server 103.

5       The wireless handset unit 101 may be a cell phone, a pager, or a PDA, as examples. The handset unit 101 is a WAP enabled device; however, handset unit 101 implementation may have different display characteristics. The WAP gateway 102, acting as an intermediary or as a proxy for the wireless  
10 handset unit 101, couples the wireless network domain with the Web. The Web server 103 may provide content for the wireless handset unit 101.

      The wireless network 104 may be one of a variety of wireless networks supported by WAP such as GSM (Global  
15 System for Mobile Communication), IS-95 CDMA (Code Division Multiple Access), IS-136 TDMA (Time Division Multiple Access), and PDC (Packetized Digital Cellular). The wireless network 104 may use the WAP protocol 106, which is a family of protocols derived from the Internet standards,  
20 while the Internet 105 uses the standard Internet HTTP protocol 107.

      In some embodiments, software components on the web server 103 may enable the presentation of tabular data on the unit 101. No modifications or additional components,  
25 either hardware or software, may be needed, in some embodiments.

      Figure 2 depicts a typical request/response model used by the wireless data services system in accordance with one embodiment of the present invention. A WAP micro-browser  
30 208 running on the wireless handset unit 101 initiates a WAP request 204 for content from the web server 103 via the WAP Gateway 102 by inputting a specific uniform resource locator (URL). The micro-browser 208 encodes the WAP request to

reduce the size and number of packets traveling over the wireless data network before sending that request to the WAP gateway 102. When the WAP gateway 102 receives the WAP request 204, it decodes the WAP request 204, using the encoder/decoder 209, resolves the address specified by the URL, and finally creates an HTTP request 205 to the Web Server 103 using the Internet HTTP protocol.

The web server 103 processes the HTTP request 205 received from the WAP gateway 102 using a CGI script 210 and then sends a response as a HTTP response 206 to the WAP gateway 102. The CGI script 210 accesses the target web content 212 directly or indirectly, through for example middleware software components, and generates tabular data 211. The CGI script 210 uses the tabular data 211 to define one or more WML cards within a WML deck and encapsulates the resulting WML deck as part of the HTTP response 206. The WAP gateway 102 encodes the HTTP response 206 using the encoder/decoder 209, creates a WAP response 207, and then sends the WAP response to the micro-browser 208.

Figure 3 shows a typical interaction between a wireless handset unit 101 and a WAP service on a web server 103 in accordance with one embodiment of the present invention. A wireless subscriber accesses WAP WML services from the wireless data service provider's web site by entering a specific URL as shown by arrow 303. This WAP request results in execution of a CGI script on the web server 103. In response to this WAP request, the web server 103 creates a WAP response and sends this response to the wireless handset 101. This action may result in display of a welcome screen on the wireless handset unit 101 as shown by the arrow 304.

This welcome screen has a set of menu options that facilitate subscriber log in and subsequent access to the

tabular data on the service provider's web site. After logging in to the service provider's web site, the subscriber selects one of the menu options to dynamically generate tabular data on the web server 103 and display that data on the wireless handset unit 101. This interaction is shown as arrow 305 in Figure 3. This action results in another WAP request to the web server 103. This time a different CGI script on the web server generates tabular data and sends a WAP response back to the wireless handset unit 101 as shown by the arrow 306.

The WAP response just received by the wireless handset unit 101 may not carry the actual tabular data created on the web server 103. Rather, it may include two pieces of information about the tabular data: (1) meta-information about the tabular data (e.g., number of rows and number of columns), and (2) a display menu to define a fragment of the tabular data to be displayed on the wireless handset unit 101. The display menu may include options such as Default Display, Row-wise Display, and Custom Display in one embodiment. Depending on the display option selected, another WAP request is generated and sent to the web server 103 as shown by arrow 307, which in turn dynamically selects a fragment of the tabular data and then sends the resulting WAP response back to the wireless handset unit 101 as shown by arrow 308. This results in a display of a fragment of the tabular data on the wireless handset unit 101. The wireless subscriber may repeat the actions 306, 307 and 308 to select and view a different fragment of the tabular data.

Any fragment of the tabular data may be displayed on the wireless handset unit 101 under the direct control of the wireless subscriber. In this way, the wireless subscriber has the freedom and flexibility to display any part of the tabular data.

Figure 4 shows an example of a user interface 400 for a wireless handset unit for the interaction depicted in Figure 3. The user interface display screens 401-406 involve stock portfolio information service to demonstrate the working principles of one embodiment.

The wireless subscriber enters the URL for the wireless service provider's web site. This will result in a Welcome Menu as shown in screen display 401.

The wireless subscriber first logs in to the wireless service provider's web site. After authenticating the wireless subscriber, a new menu screen display 402 is displayed on the unit 101. At this point the wireless subscriber may select Default Display, Row-wise Display and Custom Display in one example.

If the wireless subscriber selects the Default Display option, then the screen display 404 is displayed. This screen display 404 includes only the ticker symbol and last price for all stocks in the stock portfolio. Depending on the number of stocks in the stock portfolio, more than one WML card may be used to display all the data. At this point the wireless subscriber has the option to go back to the screen display 402 by selecting the Again soft key 407 on the unit 101 or to display more tabular data by selecting the Next soft key 408.

If the wireless subscriber selects the Row-wise Display option, then the screen display 405 is displayed. In this mode, each row of the tabular data is displayed, one row at a time, starting with the first row. The wireless subscriber at this point can either view the remaining rows in the tabular data by selecting the Next soft key 408 on the unit 101 or the subscriber can go back to the screen shown in 402 by selecting the Again soft key 407.



If the wireless subscriber selects the last option, Custom Display, then the screen display menu 403 is displayed. Using the screen display 403 the wireless subscriber can fully customize the tabular data by choosing the subset of columns for display. The custom display 406 results when the user requests Ticker, Last, Time and Open. The custom display screen 403 provides a flexible way to display the tabular data. Again, the wireless subscriber has the option to go back to the screen display 402 by selecting the Again soft key 407 or to display more tabular data by selecting the Next soft key 408 on the unit 101.

The display of tabular data may be customized by the subscriber using a wireless handset unit 101. The tabular data is generated on the server 103, and then the meta-information about the tabular data is displayed together with customization options on the wireless handset unit 101. A fragment of the tabular data is then delivered to the wireless subscriber based on the indicated preferences.

In one embodiment, the customization may be implemented using only software components in the form of CGI scripts running on the web server 103. No modifications or changes are required on the wireless handset unit 101 or the WAP gateway 202 in one embodiment. Thus, in some embodiments only existing wireless data services infrastructures may be needed.

Although embodiments of the present invention are described using the WAP protocol, the underlying working principles are applicable to other types of non-WAP wireless data services. Many modifications and variations of the present invention are possible. One such variant is the ability to save a specific preference of a wireless subscriber as a default display option.

The web server 103 may be a processor-based device as shown in Figure 5. A processor 500 may be coupled to an interface 502 to system memory 504. The interface 502 may also coupled to a bus 506. In one embodiment, the bus 506  
5 may couple another interface 508 which couples the server 103 to the Internet 105. The bridge 510 is coupled to a storage device 512 which stores the software 514.

Referring to Figure 6, the tabular data server software 514 initially detects a service request from a wireless  
10 handset unit 101 as indicated in diamond 600. When such a request is received, a welcome display is provided as indicated in block 602. The software then awaits a tabular data request as indicated in diamond 604. Once the request is received, the software causes the meta-information and  
15 display options to be displayed as indicated in block 606. When the user makes a selection, as determined in diamond 608, the tabular data is provided in the requested format as indicated in block 610.

While the present invention has been described with  
20 respect to a limited number of embodiments, those skilled in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall within the true spirit and scope of this present invention.

25

What is claimed is:

1. A method comprising:  
5 receiving a request for tabular data from a wireless device; and  
in response to the request, providing information about how the tabular data may be provided to the device.
2. The method of claim 1 wherein receiving a request  
10 includes receiving a hypertext transfer protocol request from a gateway.
3. The method of claim 2 wherein receiving a request from a gateway, includes receiving a request from a wireless gateway.
- 15 4. The method of claim 1 wherein providing information about how the tabular data may be provided to the device includes providing meta-information.
5. The method of claim 1 wherein providing information includes providing a menu of display options.
- 20 6. The method of claim 1 including providing a graphical user interface to enable a user to define a fragment of the tabular data to be displayed on the wireless device.
7. The method of claim 6 including receiving a  
25 request for a customized display of information from the wireless device.

8. The method of claim 7 including transmitting the tabular data to a gateway so that said information may be forwarded to the wireless device.

9. The method of claim 6 including providing for a  
5 row by row display of information.

10. The method of claim 9 including receiving a request for an additional row.

11. The method of claim 9, in response to the receipt of the requested information, requesting tabular data from  
10 an Internet web site, receiving the data from the Internet web site and providing the data in an appropriate format for display on the wireless device.

12. An article comprising a medium storing instructions that enable a processor-based system to:  
15 receive a request for tabular data from a wireless device; and  
in response to the request, provide information about how the tabular data may be provided to the device.

13. The article of claim 12 further storing  
20 instructions that enable the processor-based system to receive a hypertext transfer protocol request.

14. The article of claim 13 further storing instructions that enable the processor-based system to communicate through a gateway with a wireless device.

15. The article of claim 12 further storing instructions that enable the processor-based system to provide meta-information in response to the request.

16. The article of claim 12 further storing  
5 instructions that enable the processor-based system, in response to the request, to provide a menu of display options.

17. The article of claim 16 further storing  
10 instructions that enable the processor-based system to provide a graphical user interface to enable a user to define a fragment of the tabular data to be displayed on the wireless device.

18. The article of claim 17 further storing  
15 instructions that enable the processor-based system to receive a request for a customized display of information from the wireless device.

19. The article of claim 18 further storing  
20 instructions that enable the processor-based system to transmit the tabular data to a gateway so that said information may be forwarded to the wireless device.

20. The article of claim 17 further storing instructions that enable the processor-based system to provide for a row by row display of information.

21. The article of claim 20 further storing  
25 instructions that enable the processor-based system to receive a request for an additional row.

22. The article of claim 20 further storing instructions that enable the processor-based system, in response to the receipt of the requested information, to request tabular data from an Internet web site, receive the data from the Internet web site and provide the data in an appropriate format for display on the wireless device.

23. A system comprising:  
a processor-based device; and  
storage coupled to said processor-based device,  
said storage storing instructions that enable the processor-based device to receive a request for tabular data from a wireless device and, in response to the request, provide information about how the tabular data may be provided to the device.

24. The system of claim 23 wherein said system is a web server.

25. The system of claim 24 wherein said instructions enable said processor-based device to provide meta-information in response to the request.

26. The system of claim 25 wherein said storage stores instructions that enable the processor-based device to provide a menu of display options in response to said request.

27. The system of claim 26 wherein said storage stores instructions that enable said device to provide a graphical user interface to enable the user to define a fragment of the tabular data to be displayed on the wireless device.

28. The system of claim 27 wherein said storage stores instructions that enable the processor-based device to receive a request for a customized display of information from the wireless device, said request specifying the  
5 columns of information to be displayed, and in response, provide the information in the requested format.

29. The system of claim 28 wherein said storage stores instructions that enable the processor-based device to provide for a row by row display of information.

10 30. The system of claim 23 wherein said storage stores instructions that enable the device, in response to the receipt of a request for information, to request tabular data from a Internet web site, receive the data from the Internet web site and provide the data in appropriate format  
15 for display on a wireless device.

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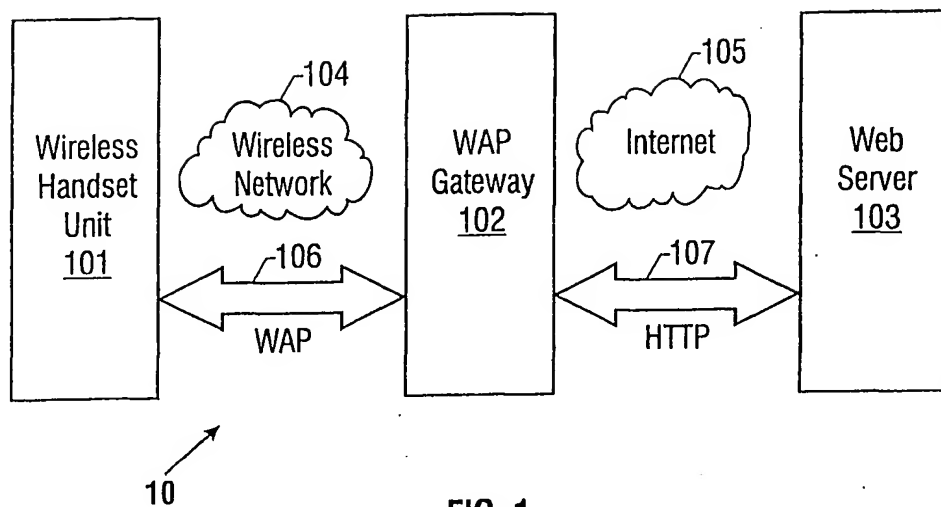


FIG. 1

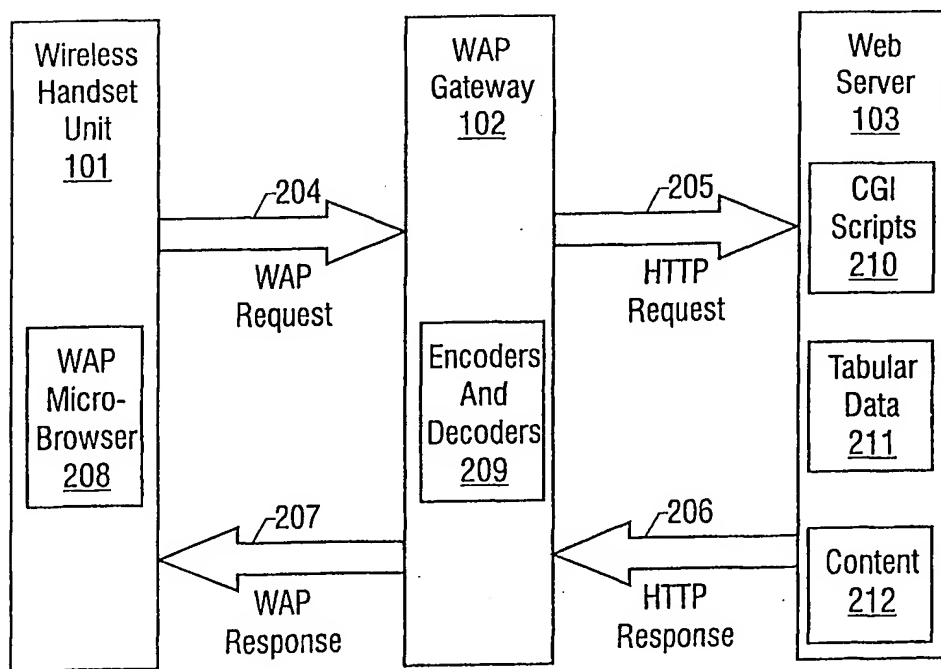


FIG. 2



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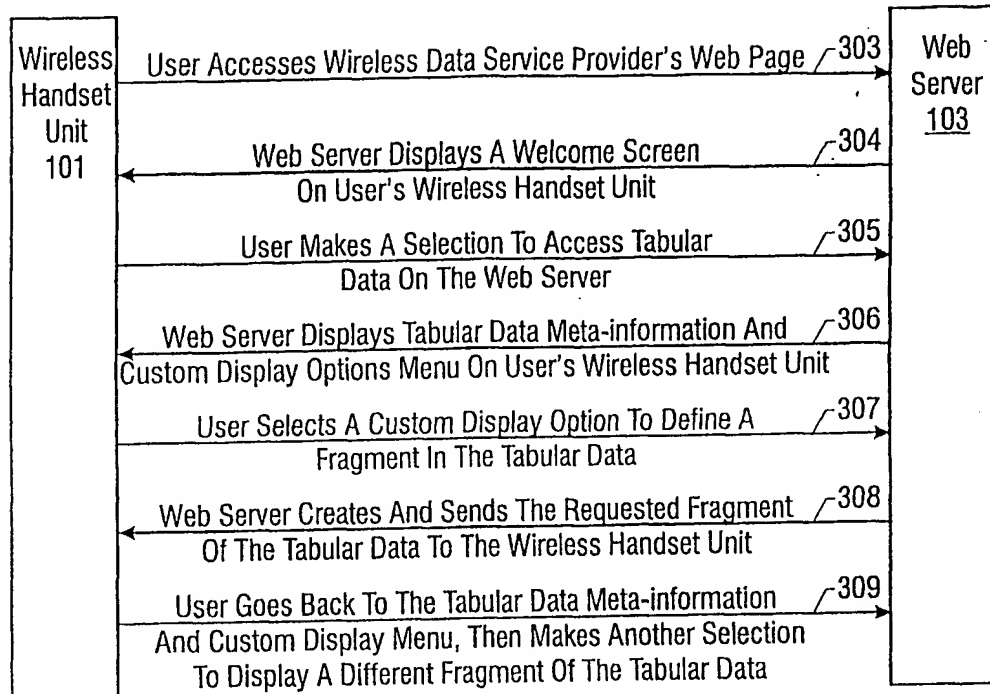
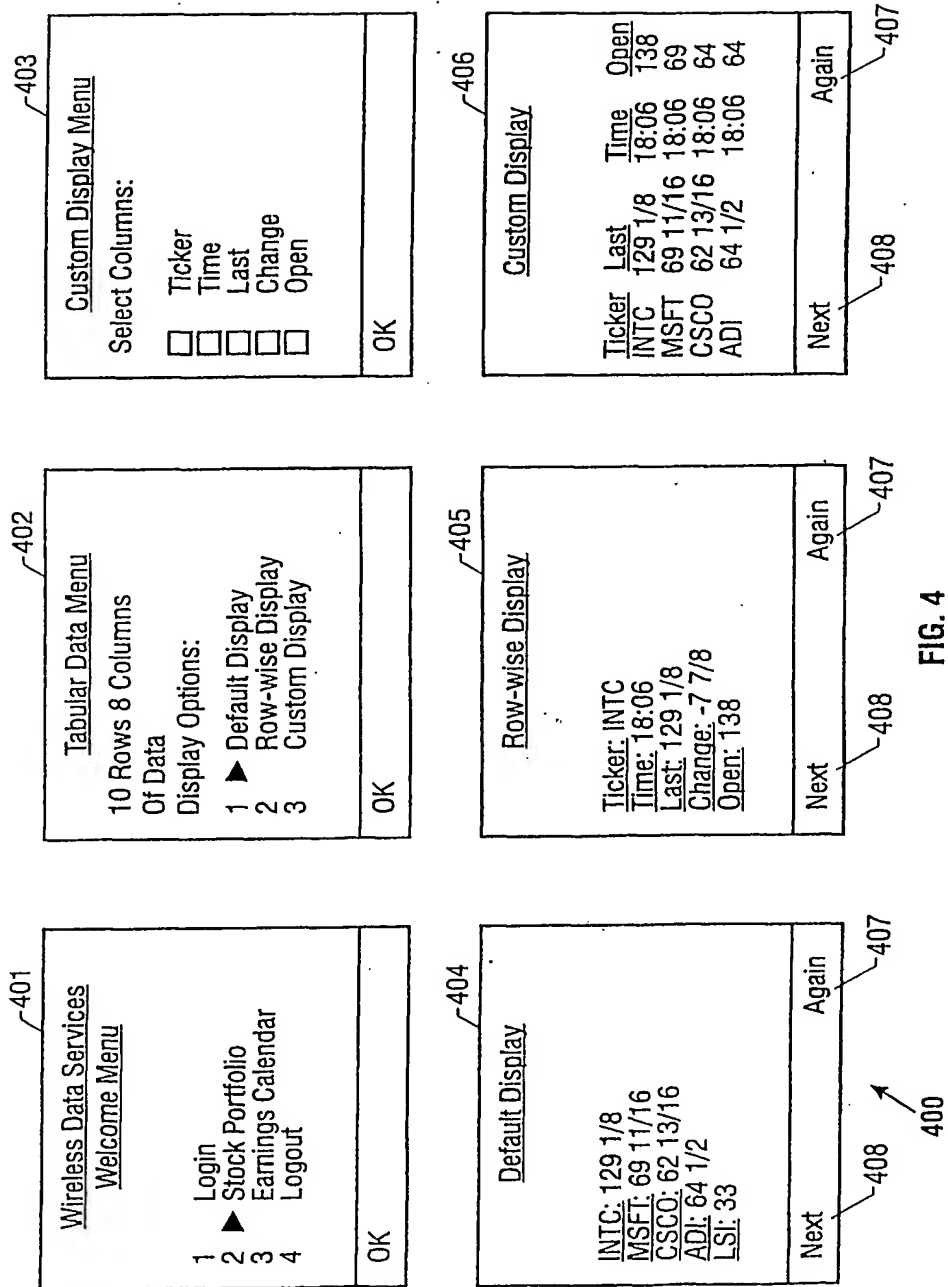
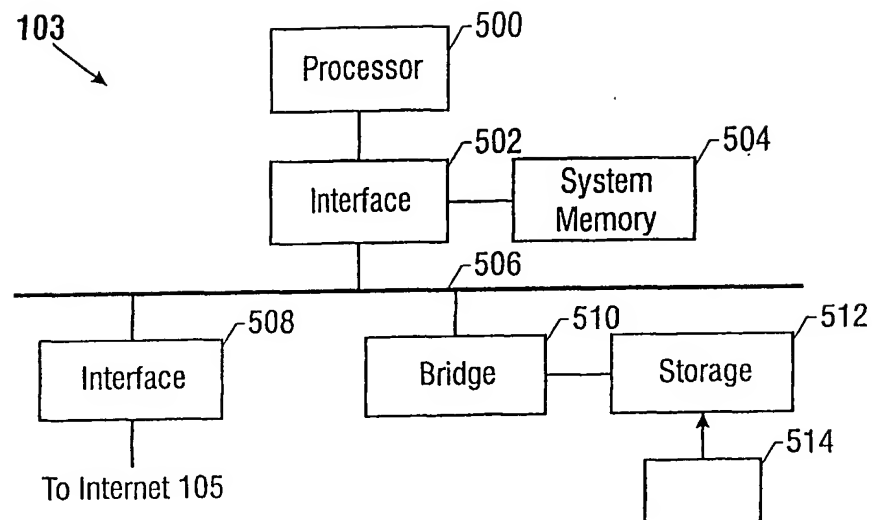


FIG. 3

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**4/5**



**FIG. 5**

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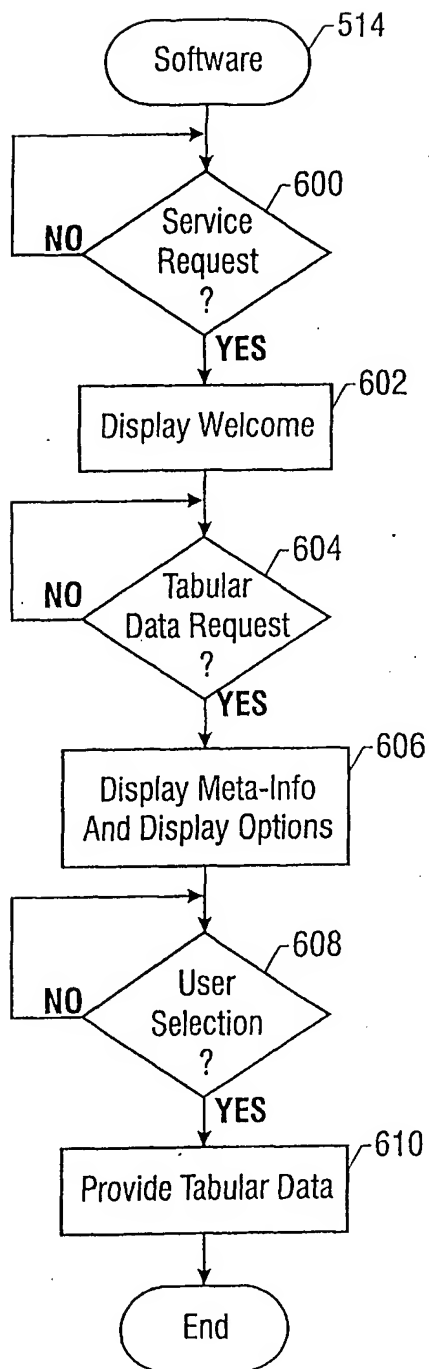


FIG. 6